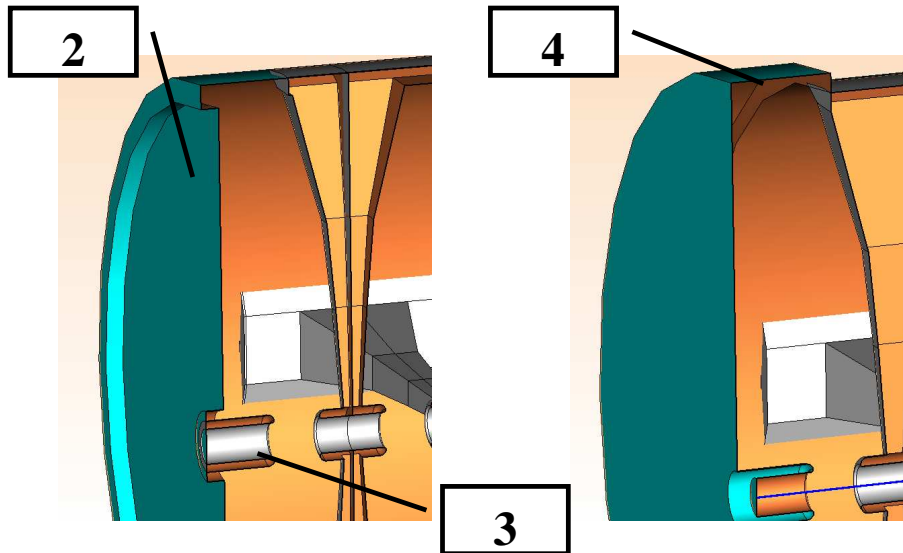


## Tuning. Sensitivity of operating frequency to some dimensions.

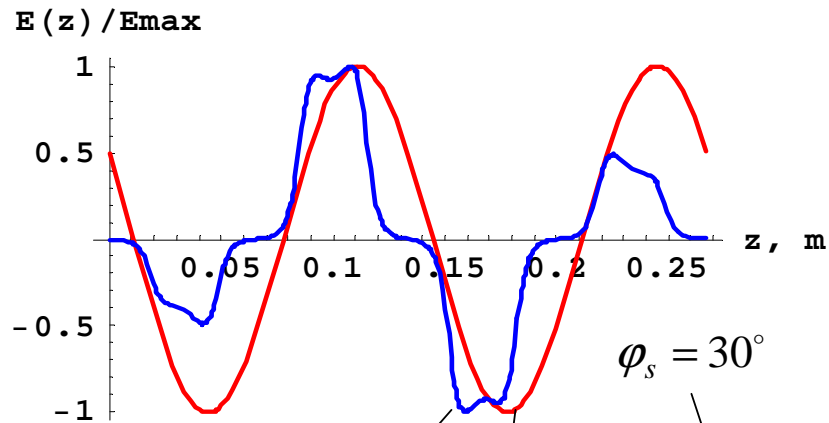


### The trivial remarks:

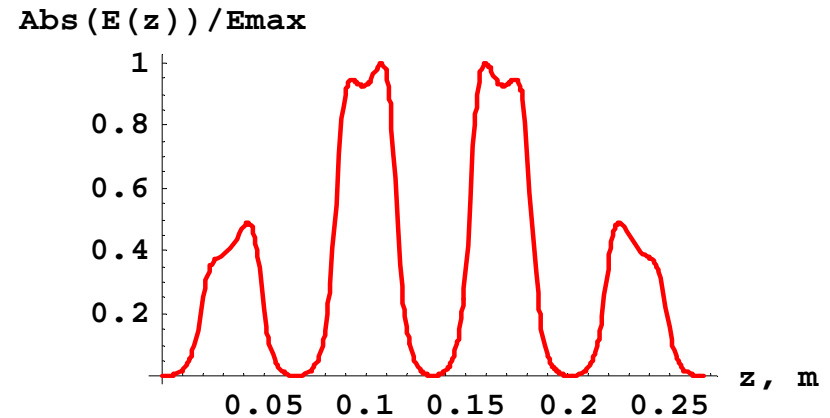
- Tuning eases the tolerances.
- Tuning must be done before final brazing.
- Tuning is pretty simple for us – we do not care much about field distribution .

1	Plunger tuner (two)			0.01-0.03	MHz/mm
2	Two end-wall tuners			0.3-0.75	MHz/mm
3	Length of two end DT (end gaps)			0.16-0.5	MHz/mm
4	End volume tuning (radius, both ends)			0.13-0.33	MHz/mm

# Shunt impedance $R_{sh}$ and losses.

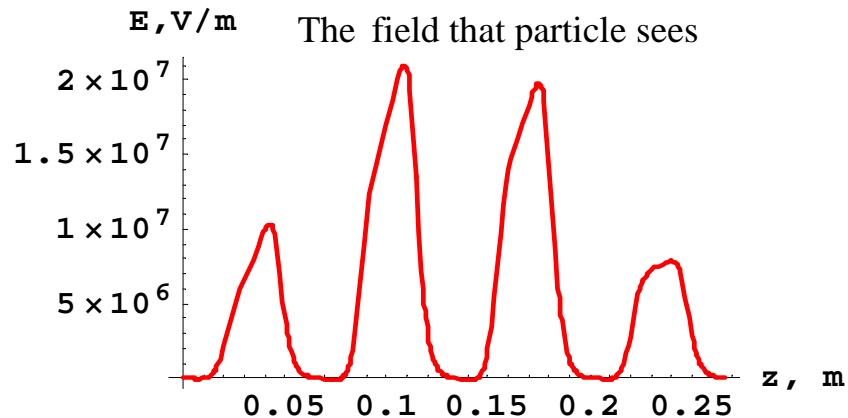


$$E_p(z) = E_z(z) \cdot \sin\left(\frac{2\pi c}{\lambda} \left(\frac{z}{\beta c} - t_0\right)\right)$$



This is usually demonstrated

$$V = \int_0^z E_p(z) dz \quad R_{sh} = \frac{V^2}{P_{losses}}$$



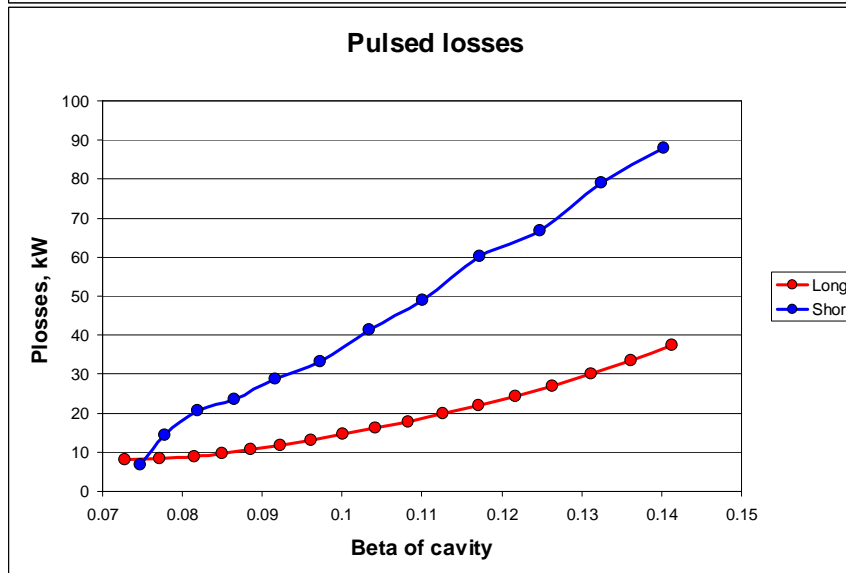
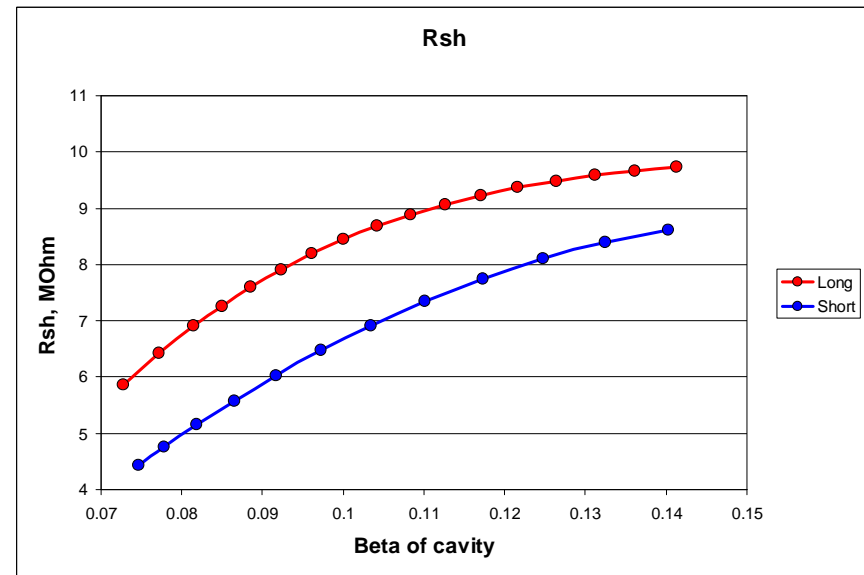
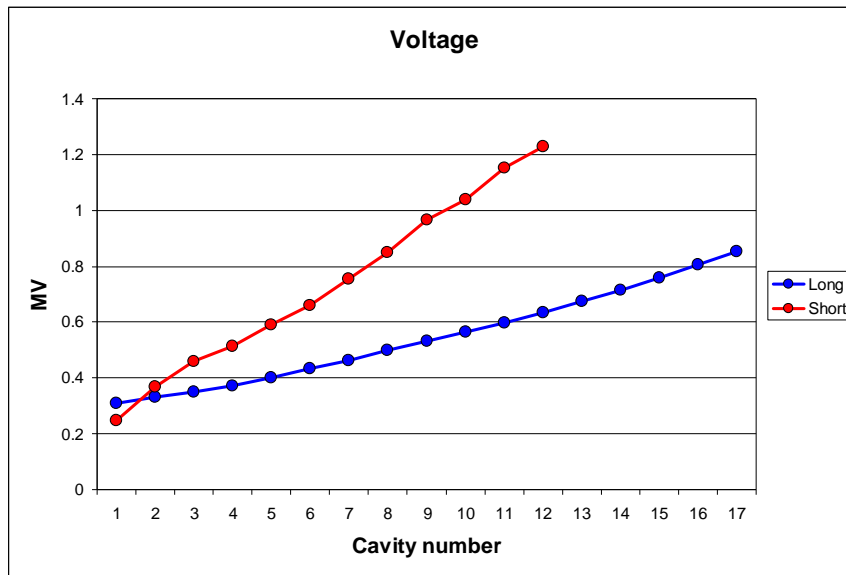
The field that particle sees

$V$  and  $P$  are calculated at fixed stored energy. Shunt Impedance **is not normalized** by length.

For voltage  $V_{bd}$ , required by beam dynamic, the losses are:

$$P_{bd} = \frac{V_{bd}^2}{R_{sh}}$$

# Losses in long and short RT CH sections



	Total pulsed losses	
	in copper	
Long lattice, all 3 spoke cav.	314	kW
Short lattice, all 3 spoke cav.	511	kW
Long lattice, 3&4 spoke *	268	kW
Short lattice, 3&4 spoke**	443	kW

\* 9 three spoke+ 8 four spoke

\*\* 7 three spoke + 5 four spoke